DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, DC 20362-5101

IN REPLY REFER TO

NAVSEAINST 9072.1A
OPR 55X13
24 NOV 89

NAVSEA INSTRUCTION 9072.1A

From: Commander, Naval Sea Systems Command

Subj: SHOCK HARDENING OF SURFACE SHIPS

Ref: (a) OPNAVINST 9072.2
(b) OPNAVINST S5513.3B, Encl (53), ID: 03B-53
(c) OPNAVINST 5510.1H, Exhibit 12B
(d) MIL-S-901
(e) NAVSEA 0908-LP-000-3010

Encl: (1) Ship Shock Hardening Technical Policy Requirements
(2) Requirements and Responsibilities for Submittal of Waiver Requests, Deviation Requests, and Shock Deficiency Correction Plans
(3) Shock Qualification Approval Process
(4) Requirements for U.S. Navy Shock Approval Letters

1. Purpose. To redefine responsibilities and technical policy requirements for shock hardening of surface ships. This is a major change to the former instruction and should be read in its entirety.

2. Cancellation. NAVSEAINST 9072.1 of 22 September 1977 was cancelled by NAVSEANOTE 5215 of 2 January 1986.

3. Background. Reference (a) establishes policy for surface ship shock hardening and assigns primary responsibility to the Commander, Naval Sea Systems Command (COMNAVSEASYSCOM). COMNAVSEASYSCOM functions as the Navy's technical authority for ship shock hardening and, in this capacity, develops and issues policy and criteria for achieving of Chief of Naval Operations (CNO) military requirements for shock hardening of ships and mission-essential ship and naval weapon systems.

4. Policy. Navy managers at all levels of the command are responsible for rigorous enforcement of CNO requirements for ship shock hardening. Compliance with shock requirements shall be verified at the Directorate level on a routine basis. Basic technical policies are identified in enclosure (1). All

2885

exceptions to these shock hardening requirements, and corrective actions on known shock deficiencies, shall be subject to formal review, approval, and monitoring as described in enclosure (2). COMNAVSEASYSCOM shall be advised of each instance of non-compliance with this instruction.

5. Responsibilities

a. Chief Engineer of the Navy (CHENG). CHENG shall review and take approval action on all requests for waiver of shock qualification requirements (enclosure (2)). This responsibility shall not be delegated.

b. Deputy Commander for Ship Design and Engineering (SEA 05).

(1) Function as the Navy's central technical authority for ship shock hardening. This authority will be exercised by the Ship Survivability Sub-Group (SEA 55X) and includes the following:

(a) The Navy Surface Ship Shock Coordinator (NSSSC) shall be designated and maintained within the Surface Ship Shock Branch (SEA 55X13). The NSSSC shall exercise lead responsibility for ship shock hardening and testing technology, and shall serve as the Command point-of-contact for shock hardening policy matters. The NSSSC will maintain coordination amongst all systems commands' Shock Coordinators and will support the Ship Characteristics and Improvement Board (SCIB) in ensuring that shock requirements are met. In addition, the NSSSC shall:

1. Recommend ship types and classes for shock trials or tests to CNO via the Design and Platform Directorates Deputy Commanders, CHENG, and COMNAVSEA. The distinction between ship "shock trials" and "shock tests" is defined by reference (a).

2. Review all shock waiver requests from a technical policy standpoint and provide comments as appropriate via SEA 05 to CHENG.

(b) Ensure that basic shock hardening technical policy for achieving CNO military requirements for shock hardening, enclosure (1), is maintained. Develop and maintain Navy shock hardening technical requirements, criteria, specifications, and standards for Navy acceptance of shock hardened items.

(c) Provide overall Navy coordination of interface shock requirements.

(d) Take action on requests for shock qualification approval as defined in enclosure (3).

(e) Manage a central Navy Shock Data Base which includes a compilation of shock hardness requirements by ship or ship class and a compilation of equipment shock qualification status, both Contractor-Furnished Equipment (CFE) and Government-Furnished Equipment (GFE).

(f) Provide central Navy coordination, monitoring and reporting of shock deficiency correction.

(g) In coordination with cognizant Participating Activity Requirements Managers, Life Cycle Managers, Program Manager Ships and Ships Logistics Managers, develop and, upon approval, implement a program of ship shock hardness, assurance, maintenance and surveillance as required by reference (a).

(h) Develop and issue general procedures and overall technical guidance for conduct of ship shock trials and tests and provide a senior technical advisor for each ship shock trial.

(i) Develop and maintain analytical methods and related computational tools which are required to support implementation of Navy shock hardening criteria.

(j) Provide standard format and documentation for shock hardening requirements for Test and Evaluation Master Plans (TEMPs), Equipment Specifications, Procurement Requests, Ship Project Directives (SPDs), etc.

(k) Manage a program for periodic inspection and certification of Government and commercial shock test facilities.

c. Deputy Commander for Weapons and Combat Systems (SEA 06)

(1) Furnish shock hardened naval ordnance, combat systems, and equipment in accordance with CNO military requirements.

(2) Establish a Directorate Shock Coordinator (DSC), who shall:

(a) Technically coordinate Navy programs for shock hardening of naval ordnance and combat systems.

(b) Support the NAVSEA Shock Coordinator in the areas of naval ordnance and combat systems.

(c) Ensure that combat systems personnel technically support ship shock trials.

(d) Maintain interface with the Navy Shock Data Base and provide regular updates of required information.

(3) Ensure that identified quantities of explosives required for ship shock trials and tests are included in the Non-Combatant Expenditure Requirement (NCER) submission to OPNAV and assure procurement of quantities identified by the Non-Combat Expenditure Allocation (NCEA) issued by CNO.

d. Program Manager Ships and Ships Logistics Managers

(1) Ensure that delivered ships are shock hardened in accordance with CNO military requirements, and ensure that the shock hardness of ships is monitored and maintained in accordance with these requirements. Ensure all overhaul contracts and major combat system design upgrades include appropriate shock qualification requirements. This requirement applies to all Government- and Contractor-Furnished Equipment.

(2) Ensure that program Ship Project Directives (SPDs) reflect CNO shock hardening requirements.

(3) Budget for and manage shock trials of the lead ship of each shock hardened class. Budget for and manage shock trials on other surface ships, boats, or craft as selected by CNO in accordance with enclosure (2) of reference (a). Budget for and manage shock tests of follow-on ships of each shock hardened class. Budgets shall include pre-trial preparations, trials conduct, post-trials repairs, and implementation of follow-up action plans.

(4) Evaluate the results of ship shock trials, including those performed by other Ship Acquisition or Ships Logistics Managers, and initiate action to correct deficiencies applicable to ships and equipment under your cognizance.

(5) Maintain a Shock Deficiency Correction Plan for each shock hardened ship under your cognizance as defined in enclosure (2).

(6) Provide to the Inspection and Survey Board (INSURV) via COMNAVSEA the status of all equipment relative to shock prior to acceptance trials.

e. Deputy Commander for Acquisition, Planning and Appraisal (SEA 90)

(1) Provide drafts of each Test and Evaluation Master Plan (TEMP) and TEMP revisions to SEA 55X for a review of compliance with CNO shock hardening and testing requirements, and assist in the adjudication of comments.

(2) Include compliance with shock requirements as an item in presentations to the Acquisition Review Board (ARB).

f. Participating Activity Requirements Managers (PARMs) and Life Cycle Managers (LCMs)

(1) Furnish shock hardened systems and equipment in accordance with CNO military requirements. Maintain and provide complete shock qualification records to the Navy Shock Data Base. Comply with enclosures (1) and (2).

(2) Ensure that all acquisition and development contracts for mission-essential equipment or systems include shock qualification requirements in accordance with this instruction and the applicable specifications.

(3) Develop and maintain equipment and system specifications to ensure that shock hardness is not degraded. Ensure that quality and inspections standards which were applied to shock qualified items are maintained throughout the production run. Require periodic repeat shock qualification testing during long production runs.

(4) Exercise approval authority over shock qualifications as defined in enclosure (3).

(5) Issue shock qualification approval letters in accordance with enclosure (4) for equipment developed under systems command authority.

(6) Plan and budget for the correction of shock deficiencies identified during both the equipment qualification process and ship shock trials. In budgeting for shock deficiency corrections, include funding for conducting tests and analysis to determine the cause or causes of the deficiency and the development of the modifications to prevent its recurrence.

g. Naval Ship Systems Engineering Station (NAVSSES). NAVSSES is SEA 55X's In-Service Engineering Agent (ISEA) for shock hardening and when tasked by NAVSEA shall:

2885 5

(1) Maintain and operate the Navy Shock Data Base.

(2) Technically support requirements for shock qualification and installation of ship systems and equipment by Naval Shipyards; Supervisors of Shipbuilding, Conversion and Repair; Planning and Engineering for Repairs and Alterations (PERAs); and private yards serving as a Planning Yard via SUPSHIP.

(3) Develop and implement a program for periodic inspection and certification of Government and commercial shock test facilities.

(4) Provide support to the Navy's ship shock trials and tests programs.

h. David Taylor Research Center (DTRC). DTRC (Underwater Explosions Research Division (DTRC/UERD)) is SEA 55X's In-Development Engineering Agent (IDEA) for shock testing and hardening, and when tasked by NAVSEA shall:

(1) Support the development and refinement of shock hardening technical criteria, analysis methods, and related procedures.

(2) Technically support the PMSs during ship shock trial preparation and conduct. Technically direct ship shock trial instrumentation and explosive charge operations. Be responsible for furnishing, installing, and operating ship shock trial instrumentation and for handling, positioning, arming, and firing of explosive charges.

(3) Manage shock tests of ships conducted under the RDT&E appropriation.

(4) Submit annual and five-year projected quantities of explosives required for ship shock trials and tests to SEA 06 via SEA 55X to support NCER submissions.

i. Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP) Brooklyn. SUPSHIP Brooklyn is SEA 55X's agent responsible for review and approval of shock qualifications, and when tasked by NAVSEA shall:

(1) Provide technical guidance and related training to Navy and contractor personnel responsible for implementation of CNO shock hardening requirements. Develop and implement a program for training and certification of Navy personnel assigned to approve shock qualifications on behalf of SEA 55X.

2885 6

(2) Take approval action on requests for approval of dynamic shock mathematical models and analyses as detailed in enclosure (3).

(3) Technically support review and approval requirements associated with shock test qualification of ship systems and equipment as detailed in enclosure (3).

(4) Provide additional technical support of shock hardening programs and related projects (such as ship shock trials) as tasked by NAVSEA.

j. Supervisors of Shipbuilding, Conversion and Repair (SUPSHIPs). The local SUPSHIPs shall:

(1) Enforce the ship contract shock specifications.

(2) Serve as NAVSEA's agent for review and approval of shock qualifications submitted by the shipbuilders, as detailed in enclosure (3).

(3) Conduct specialized shock qualification and installation technical inspections of shock hardened ships during all phases of construction. Verify that equipment is mounted aboard ship in a manner consistent with its shock qualification.

(4) Participate in the pre-shock trial planning and technical inspections and in the actual conduct of the shock trials.

(5) Issue shock qualification approval letters in accordance with enclosure (4) for Contractor-Furnished Equipment (CFE).

6. Exception. In accordance with the responsibilities assigned under Presidential Executive Order 12344, as codified in Public Law 98-525 dated 19 October 1984, the administrative requirements of this instruction do not apply to systems or equipment under the cognizance of the Deputy Commander for Nuclear Propulsion, SEA 08.

a. SEA 08 shall separately exercise control over all shock hardening tests, analyses, specifications, deviations, waivers, and approval actions for items under SEA 08 cognizance in accordance with SEA 08 procedures which achieve the intent of this instruction. SEA 08 is responsible for ensuring that equipment and systems under SEA 08 cognizance meet the shock requirements of this instruction.

b. SEA 08 concurrence shall be obtained for all actions taken in compliance with the requirements of this instruction which

affect the nuclear propulsion plant or associated nuclear support facilities.

7. Security Requirements. Documentation relative to shock hardening shall be classified in accordance with reference (b) and affixed with an appropriate distribution statement shown below as required by reference (c). The following security markings shall Be affixed to all documentation, classified and unclassified, as appropriate:

DISTRIBUTION STATEMENT "D" FOR NON-NUCLEAR MATERIAL
DISTRIBUTION STATEMENT "F" FOR NUCLEAR MATERIAL
CLASSIFIED BY: OPNAVINST S5513.B3, Encl (53), ID 03B-53
DECLASSIFY: OADR

WARNING - THIS DOCUMENT CONTAINS TECHNICAL DATA WHOSE EXPORT IS RESTRICTED BY THE ARMS EXPORT CONTROL ACT (TITLE 22, U.S.C. SEC. 2751 et seq.) OR EXECUTIVE ORDER 12470. VIOLATIONS OF THESE EXPORT LAWS ARE SUBJECT TO SEVERE CRIMINAL PENALTIES.

DESTRUCTION NOTICE - FOR CLASSIFIED DOCUMENTS FOLLOW THE PROCEDURES IN DOD 5220.22M, INDUSTRIAL SECURITY MANUAL, SECTION II-19, OR OPNAVINST 5510.1H, CHAPTER 17. FOR UNCLASSIFIED, LIMITED DOCUMENTS, DESTROY BY ANY METHOD THAT WILL PREVENT DISCLOSURE OF CONTENTS OR RECONSTRUCTION OF THE DOCUMENT.

P. M. HEKMAN, JR.

Distribution:
SNDL FKP8 SUPSHIP
FKP16 NAVSSES
FKQ6E DTRC
NAVSEA Special List Y3

Copy to:
SNDL A3 CNO (OP 02, 03, 037, 04, 05)
B2D DCASR
C4L DNL
C84B NAVMATDATASYSGRU
FF8 Inspection and Survey Board
FKA1A COMNAVAIRSYSCOM
FKA1B COMSPAWARSYSCOM
FKM13 SPCC
FKP7 NAVSHIPYD
FKQ6 Research and Development Activities (less FKQ6E)
FT88 EDOSCOL
Naval Publications and Printing Service Office, NDW

Stocked:
COMNAVSEASYSCOM
(SEA 09B38)

2885 8

SHIP SHOCK HARDENING
TECHNICAL POLICY REQUIREMENTS

1. Introduction. The technical policy requirements applicable to the shock hardening of ships as required by this instruction are described below.

2. Technical Policy. Ship Specifications for shock hardened ships and specifications for equipment, weapons, or systems vital to the survivability and mission-keeping capabilities of shock hardened naval ships shall contain requirements for shock hardening in accordance with the technical standards listed herein, unless a specific waiver is granted in accordance with this instruction. The following standards, which apply to Contractor-Furnished Equipment and Government-Furnished Equipment, shall be invoked for all equipment and systems meeting the applicability criteria defined in paragraph 5 below.

a. Items whose size and weight permit shock testing in accordance with reference (d) shall meet the shock test requirements contained therein.

b. Items which cannot be shock tested in accordance with reference (d) due to size or weight limitations, and foundations for equipment which are required for performance of the ship functions specified below, shall be proven acceptable by analysis. The loadings which are to be used in the analysis shall be established on the basis of dynamic analysis, using the shock design method of reference (e). This requirement does not apply to ship structure such as decks and bulkheads.

c. Strength members in either Shock Grade A or Shock Grade B items (as defined by reference (d)) shall not be fabricated from brittle materials. For the purposes of this instruction, a brittle material is defined as any material possessing an elongation capability of less than ten percent.

d. Items intended for installation aboard operational ships (e.g. via the Fleet Modernization Program (FMP)) or aboard ships undergoing modernization or conversion shall possess shock resistance characteristics equal to, or better than, those originally required for the ship in question. Unless otherwise directed by the Acquisition Manager, the following basic shock hardening criteria apply to modernization or conversion of shock hardened ships:

(1) Existing shipboard systems need not be upgraded to match the higher shock resistance of new equipment or systems installed during modernization or conversion unless upgrading of

ship shock resistance is a specific objective of the modernization or conversion.

(2) The shock resistance of new shipboard installations shall not be purposely reduced to equal that of existing ship systems.

(3) Shock testing requirements and foundation shock design requirements applicable to new equipment and/or foundations furnished for modernization or conversion programs shall be identical to those applied to new construction ships.

e. The fact that this instruction does not require shock hardening of items under certain circumstances does not relieve the procuring activity of its responsibility to satisfy shock hardening requirements where invoked by other applicable directives, such as for transportation or handling shock.

f. Items of expendable ordnance shall satisfy shock requirements while in the stowed configuration and shall be capable of performing their intended function after launch. Weapon handling and loading equipment which is part of the firing cycle and has a specified reload and/or firing rate shall meet shock hardening requirements in both the stowed and operating configurations. Other weapons handling and loading equipment, such as forklift trucks, aero-skids, rolling deck equipment, and weapon elevators, shall meet shock requirements in the stowed configuration.

g. The capability of items to withstand shock aboard ship is dependent in part upon the design and arrangement of interfacing shipboard stowage systems, missile magazines, foundations, or other supporting structure. The intended shipboard supporting structure must be defined in development specifications in sufficient detail to ensure that subsequent shock qualification actions will reflect the planned shipboard structural interface. Similarly, shipbuilding specifications must include previously established interface requirements. Interface shock requirements will be defined and coordinated by SEA 55X.

h. Any shock test failures or malfunctions which occur during qualification testing and which violate specified acceptance criteria shall be fully resolved through redesign and retesting to assure that the final design complies with specified shock hardening requirements.

i. Any modifications to a shock qualified system or piece of equipment shall be cause for additional shock qualification. This qualification will be either a "Request for Shock Test Extension"

10

2885

or retest in accordance with reference (d). The shock qualification request shall be submitted for approval in accordance with enclosure (3) of this instruction.

3. Specification Policy. Where shock hardening is required, the cognizant ship or equipment Acquisition Manager shall assure that development specifications and Military Specifications for equipment and systems are in accordance with the following policy:

a. Portions of the specifications dealing with shock requirements shall be prepared by (or reviewed by) Navy personnel who possess in-depth knowledge of the functional requirements of the items and full knowledge of the applicable Navy shock hardening criteria.

b. The specification shall state the shock grade of the item, shall reflect the applicable requirements of this instruction, and, if shock testing is required, the specification shall provide the shock test Ordering Data (i.e. Shock Test Acceptance Criteria, etc.) required by reference (d).

c. Specifications shall not modify the requirements of references (d) or (e), or other applicable shock hardening standards unless the modifications are approved by SEA 55X.

d. Specifications shall not delete or reduce the requirements of references (d) or (e), or other applicable shock hardening standards unless a waiver is obtained in accordance with this instruction.

4. Enforcement Policy. Shock hardening requirements, where invoked, shall be enforced by the cognizant ship or equipment Acquisition Managers in accordance with this instruction.

5. Applicability. The shock hardening criteria as specified by reference (a) and directed by this instruction are applicable as follows:

a. Ships. Shock hardening is required for all ships which must be capable of operating in the combat shock environment. These include all combatant ships, amphibious ships, mineforce ships, and other ships which are intended to remain operational in wartime in combat zones (e.g. AOE). The CNO may require shock hardening of other ships on a case basis.

b. Naval Aircraft. Aircraft must be capable of resisting shock loads in the stowed configuration and mission-essential aircraft-mounted items such as auxiliary fuel tanks, and avionics

2885 11

pods which are stowed aboard air capable ships must be shock resistant in their shipboard stowed configurations.

c. Boats and Craft. Shock hardening requirements will be determined by CNO on a case basis for air cushion vehicles, hydrofoils, surface effect ships, small boats, and similar craft. Landing craft which are stowed in the well deck of shock hardened ships may, at the discretion of CNO, be required to withstand shock in the stowed configuration. Boats and craft stowage may, by virtue of their location aboard ship, be required to meet the Grade B shock requirements as specified in reference (d).

d. Shipboard Systems. Grade A shock hardening criteria, as defined in reference (d), are applicable to items which are required for performance or direct and vital support of the following mission-essential functions aboard shock hardened ships:

(1) Ship control and propulsion
(2) Command-and-control
(3) Navigation
(4) Communications
(5) Surface, air, and underwater surveillance
(6) Countermeasures
(7) Launching, retrieving, fueling, defueling, rearming, and handling of aircraft and surface small craft
(8) Essential checkout and maintenance of aircraft and ordnance
(9) Fire control, firing or launching, and guidance of missiles and other weapons
(10) Stowage, handling, and reloading of weapons
(11) Replenishment at sea (stowed configuration)
(12) Minehunting and sweeping
(13) Transporting and landing troops and combat payload (assault ships)
(14) Casualty and damage control
(15) Collective Protection System (CPS) capability
(16) Other capabilities as deemed necessary for the specific ship class by CNO

e. Grade B. Grade B shock hardening criteria, as defined in reference (d), are applicable to items whose operation is not essential to the safety of the ship or to the direct and vital support of the mission-essential functions identified above but which, due to either location or function, could become a hazard to personnel, to Grade A items, or to the ship as a whole as a result of exposure to shock.

REQUIREMENTS AND RESPONSIBILITIES FOR SUBMITTAL OF WAIVER REQUESTS, DEVIATION REQUESTS, AND SHOCK DEFICIENCY CORRECTION PLANS

1. Introduction. Requirements and responsibilities for submittal of exceptions to this instruction are described below.

2. Definitions. General definitions, as applicable to this instruction, are as shown below. These definitions are somewhat different than those used in previous instructions. Specific uses of these definitions are as detailed in paragraphs 3, 4, and 5 below.

a. Waiver. A waiver is for an individual piece of equipment or system for which the CNO shock hardening and qualification requirements have been either omitted, deleted, or reduced.

b. Deviation. A deviation is for an individual piece of equipment that is to be, or has been, shock qualified to standards other than those specified in references (d) and (e) yet which fulfill the technical intent of references (d) and (e).

c. Deficiency. Any piece of equipment that has either proven to be deficient during shock trials or that has been installed prior to completion of the shock qualification is a deficiency.

3. Waiver Requests.

a. A waiver request shall be submitted for Chief Engineer of the Navy (CHENG) approval under the following circumstances:

(1) In cases where the responsible Directorate proposes to omit, delete, or reduce CNO shock qualification requirements for shipboard equipment or systems in development or procurement documents such as TEMPs, Combat System Acquisition Plans, and Purchase Specifications.

(2) If at any time it is proposed to terminate efforts to shock qualify shipboard equipment or systems.

(3) In cases where the responsible Directorate proposes to omit, delete, or reduce the shock qualification provisions of specifications for ship overhaul or modernization.

b. Waiver requests shall be prepared and forwarded for approval action as soon as the requirement for the waiver becomes apparent.

2885 13

c. Waiver requests will be prepared by the Navy office immediately responsible for procurement of the item (e.g. PARM, LCM) and forwarded via the cognizant Deputy Commander and the cognizant Platform Directorate to CHENG with a copy to the NAVSEA Shock Coordinator.

d. CHENG approval of a waiver request does not relieve the cognizant PMS, SLM, or PARM of responsibility for achieving CNO required shock hardness to the maximum extent feasible. Items furnished for shipboard installation under approved waivers shall be identified as shock deficiencies and, where feasible, shall be subject to corrective action as described in paragraph 5 below.

e. The information listed below shall be included in all shock qualification waiver requests:

(1) Identification and description of the item, including size, weight, mounting, nomenclature, common name, and basic functions.

(2) The status of the current development or procurement program responsible for developing or acquiring the item. Planned actions and schedules for shock qualification of the item or system.

(3) Navy office and Directorate responsible for furnishing the item.

(4) Scope of the waiver, number of units to be delivered under terms of the waiver, specific existing ships affected by approval of the waiver, and future (anticipated) ship classes that may be affected by approval of the waiver.

(5) Waiver approval pros and cons, a succinct, objective analysis of arguments for and against approval of the waiver, with conclusions. Emphasis should be given to the impact on the mission-keeping capability of the ship; both immediately after attack, prior to reaction by the ship's force, and probable long-term effects; should the item or system that the waiver is for, fail in a combat shock environment. In cases where the system or equipment suffers from known shock deficiencies, as revealed by shock design analysis or testing, describe the deficiency and assess the effect.

f. To avoid delays in ship delivery, it is permissible to install items prior to completion of shock qualification actions without submittal of a waiver. In cases where shipboard equipment or systems will not comply with shock qualification requirements at the time of ship delivery from new construction or from repair,

2885 14

overhaul, or modernization, the CNO shall be notified via the Navy Surface Ship Shock Coordinator and CHENG. Such items will be specifically identified in the Shock Deficiency Correction Plan (see paragraph 5 below).

g. If a waiver request has been disapproved, then CNO requirements for shock qualification of mission-essential items must be included in development or acquisition documents.

4. Deviation Requests.

a. A shock qualification deviation request shall be submitted for NAVSEA 55X approval when:

(1) Planned, or currently employed, shock qualification procedures (either test or analysis) differ in detail from those specified by NAVSEA, references (d) and (e), but are believed to fulfill the technical intent of NAVSEA requirements.

(2) The use of a shock test machine or floating shock platform of a type not identified in reference (d) is proposed.

b. The information listed below shall be included with each deviation request submitted:

(1) Identification and description of the item, including size, weight, mounting, nomenclature, common name, and basic functions.

(2) A detailed comparison of the shock qualification procedure that was used and the U.S. Navy standard procedures described in references (d) and (e).

(3) A discussion with supporting rationale on why the non-standard shock qualification procedure that was used ensures that the equipment is shock hardened to a level equal to, or better than, the level that would be obtained using standard U.S. Navy shock qualification procedures.

(4) Rationale for why standard U.S. Navy shock qualification procedures were not, or cannot be, used.

5. Shock Deficiency Correction Plan. Beginning 1 October 1989, a Shock Deficiency Correction Plan shall be established and maintained for each modern shock hardened ship by the cognizant PMS or SLM and shall be submitted semiannually via CHENG to CNO. A copy shall also be provided to the NSSSC (NAVSEA 55X13). Specific ship classes to be covered include AOE 6, CVN 68, CGN 38, CG 47, DD 963, DDG 51, DDG 993, FFG 7, LHA 1, LHD 1, LSD 41,

2885 15

MCM 1, MHC 51, and future shock hardened ships. This Shock Deficiency Correction Plan satisfies the requirement of reference (a) for a follow-up action plan for shock trials. These plans shall be applicable to all GFE and CFE, and shall provide the following:

a. Identification of items which have proven deficient during previous ship shock tests or shock trials.

b. For ships under the SCN envelope, identification of all installations which are not expected to be shock qualified prior to end of the SCN envelope.

c. For ships outside the SCN envelope, the listing will continue to track those shock deficiencies carried over from the SCN period. It will also identify any additional shock deficiencies which may have resulted from alteration or repair of previously shock qualified installations. The listing shall also track deficiencies identified during shock trials (or tests) of a ship of the class, if applicable. Applicable deficiencies reported during shock trials of other classes shall also be tracked, when noted by the cognizant PMS or SLM. Note: For ships delivered prior to 1 July 1989, the listing will track action on shock trial deficiencies but will not necessarily identify items which have not been shock qualified.

d. For future shock hardened ships, the first Shock Deficiency Correction Plan for the new class shall be submitted to CHENG prior to the final Command and Senior Reviews conducted before the completion of contract design. This first plan shall identify all installations which are not expected to be shock qualified at the time of ship delivery. The plan shall also identify those items for which a waiver has been granted, is pending, or is anticipated. An assessment of the potential effects of loss of the non-shock hardened items upon mission capabilities shall be provided. During the Reviews a summary of the Shock Deficiency Correction Plan shall be presented.

e. For each shock deficiency listed, a summary of the approved plan and schedule for corrective action shall be provided. (For items installed under authority of approved waivers, corrective action shall be accomplished to the extent feasible.) Progress on each corrective action during the previous 6 months will be indicated. Items that have been added since the issuance of the previous Shock Deficiency Correction Plan shall be specifically noted.

f. A copy of the Shock Deficiency Correction Plan shall be provided to the CNO, INSURV, and the applicable ship prior to Acceptance Trials.

SHOCK QUALIFICATION APPROVAL PROCESS

1. Introduction. For equipment shock qualification, dual shock approval is required. First, the PARM, LCM, local Supervisor, or other submitting activity shall review the shock qualification request and shall certify that the equipment has met the minimum level of acceptance (i.e. the equipment demonstrated the ability to continue to operate properly before, during, and after exposure to shock). Secondly, SEA 55X or SUPSHIP Brooklyn shall ensure that the report or analysis meets the requirements of references (d) and (e) and shall provide recommendations and/or comments to the PARM, LCM, local SUPSHIPs, or other submitting activity on the acceptability of the equipment or system from a shock viewpoint. SEA 55X may delegate their approval authority to other activities or individuals that are technically capable of ensuring that the shock requirements of reference (d) have been met. The PARM, LCM, local SUPSHIPs, or other submitting activity shall then issue a shock qualification approval letter in accordance with enclosure (4) of this instruction. The specific responsibilities for approval of shock qualifications are described below.

2. Government-Furnished Equipment (GFE)

a. LIGHTWEIGHT and MEDIUM WEIGHT Shock Tests and Extensions

(1) SEA 55X, or the Delegated Approval Authority (DAA), will review for approval or disapproval all requests for shock qualification and shall provide written recommendations and comments to the PARM on the acceptability of the equipment or system that was tested or for which a request for extension was submitted.

(2) PARM and LCMs will:

(a) Review all lightweight and medium weight shock test reports or requests for extension for acceptability of the equipment or system.

(b) Provide SEA 55X, or the DAA, a copy of the PARM or LCM comments, and the lightweight and medium weight shock test reports or request for extension with a request for review and approval or disapproval.

(c) Issue a letter to the contractor which incorporates SEA 55X (or DAA) comments, either approving or disapproving the shock qualification of the equipment or system. The letter shall, as a minimum, contain the information required by enclosure (4) of this instruction.

2885 17

b. HEAVYWEIGHT Shock Test Procedures, Shock Test Reports, and Extensions

(1) SEA 55X, or the DAA, will review for approval or disapproval all heavyweight shock test procedures, test reports or requests for extension, and provide written recommendations and comments to the PARM or LCM on the acceptability of the equipment or system that was tested or for which a request for extension was submitted.

(2) PARMs or LCMs will:

(a) Review all heavyweight shock test procedures, reports or requests for extension for acceptability of the equipment or system.

(b) Provide SEA 55X, or the DAA, a copy of the PARM or LCM comments and the heavyweight shock test procedure, report, or request for extension with a request for review and approval or disapproval.

(c) Issue a letter to the contractor which incorporates SEA 55X (or DAA) comments, either approving or disapproving the shock test procedure or the shock qualification of the equipment or system. For equipment or system qualification approval, the letter shall, as a minimum, contain the information required by enclosure (4) of this instruction.

c. Dynamic Analysis and Extension Based Upon Analysis

(1) SUPSHIP Brooklyn will review for approval or disapproval all mathematical model reports, dynamic analyses, or requests for extension based upon analyses submitted in accordance with reference (e) and provide written recommendations and comments to the PARM or LCM on the shock acceptability of the equipment or system.

(2) PARMs or LCMs will:

(a) Provide SUPSHIP Brooklyn a copy of all mathematical model reports, dynamic analyses, or requests for shock extension based upon analysis with a request for review and approval or disapproval.

(b) Review all such reports, analyses, or extensions for equipment or system acceptability and issue letter to contractor which incorporates the SUPSHIP Brooklyn comments, either approving or disapproving the shock qualification of the equip-

18

2885

ment or system. The letter shall, as a minimum, contain the information required by enclosure (4) of this instruction.

3. Contractor-Furnished Equipment (CFE)

a. LIGHTWEIGHT and MEDIUM WEIGHT Shock Tests and Extensions

(1) SEA 55X, or the DAA, shall provide the local SUPSHIPs a written recommendation of either approval or disapproval of the equipment or system shock qualification. The DAA may or may not be the local SUPSHIPs.

(2) Local SUPSHIPs will:

(a) Review all lightweight and medium weight shock test reports or requests for extension for acceptability of the equipment or system.

(b) Provide the DAA a copy of the local SUPSHIPs' comments and the lightweight and medium weight shock test reports or extension requests with a request for review and approval or disapproval.

(c) Issue a letter to the contractor which incorporates the DAA comments, either approving or disapproving the shock qualification of the equipment or system. The letter shall, as a minimum, contain the information required by enclosure (4) of this instruction.

b. HEAVYWEIGHT Shock Test Procedures, Shock Test Reports, and Extensions

(1) SEA 55X, or the DAA, will review for approval or disapproval all heavyweight shock test procedures, shock test reports, or requests for extension. SEA 55X, or the DAA, shall provide the local SUPSHIPs a recommendation of either approval or disapproval. The DAA may or may not be the local SUPSHIPs.

(2) Local SUPSHIPs will:

(a) Review all heavyweight shock test procedures, reports, or requests for extension for acceptability.

(b) Provide SEA 55X, or the DAA, a copy of the SUPSHIP comments and all heavyweight shock test procedures, reports or requests for extension with a request for review and approval or disapproval.

2885 19

(c) Issue a letter to the contractor which incorporates SEA 55X (or DAA) comments, either approving or disapproving the shock test procedure or the shock qualification of the equipment or system. For equipment or system qualification approval, the letter shall, as a minimum, contain the information required by enclosure (4) of this instruction.

c. Dynamic Analysis and Extension Based Upon Analysis

(1) SUPSHIP Brooklyn will review for approval or disapproval all mathematical model reports, dynamic analyses or extensions based upon analysis submitted in accordance with reference (e) and provide written recommendations and comments to the local SUPSHIPs.

(2) Local SUPSHIPs will:

(a) Provide SUPSHIP Brooklyn a copy of all mathematical model reports, dynamic analyses, or requests for extension based upon analysis with a request for review and approval.

(b) Review all such reports, analyses, or extensions for equipment or system acceptability and issue a letter to the contractor which incorporates the SUPSHIP Brooklyn comments, either approving or disapproving the shock qualification of the equipment or system. The letter shall, as a minimum, contain the information required by enclosure (4) of this instruction.

4. Adjudication. SEA 55X13 has the responsibility for presentation of unresolved issues to CHENG for resolution as the final adjudicator of all shock qualification issues.

REQUIREMENTS FOR U.S. NAVY SHOCK APPROVAL LETTERS

Letters documenting the Navy's acceptance or rejection of requests for shock qualification, either by shock test or by shock test extension, shall be issued by the cognizant PARM or SUPSHIP within 60 days (unless otherwise specified in the contract or order) of submittal of the required documentation as specified in references (d) or (e), as applicable. The definitions of Test Category, Shock Grade, Equipment Class, Shock Test Type, and Mounting Location are those as contained in reference (d). The approval letters and shock acceptance forms shall be signed by a cognizant individual having signature authority and also as identified by enclosure (3) to this instruction. The approval letters shall contain the information and reflect the format as shown in the sample letter on the next page.

From: (PARM or SUPSHIP)
To: (Company or Agency which submitted the shock qualification request for approval)

Subj: APPROVAL OF REQUEST FOR MIL-S-901 SHOCK QUALIFICATION

Ref: (a) (Reference to the incoming request to the Navy for shock qualification approval)
(b) * (see next page)
(c) *
(d) *
(e) *
etc.

Encl: (1) Shock Test Acceptance Information for (Name of Equipment) or Shock Analysis Acceptance Information for (Name of Equipment)

1. References (a) through ( ) submitted information for review and requested (shock test or shock test extension) approval in accordance with Military Specification MIL-S-901 for the following equipment:

Equipment Name: (Name and capacity or rating)

Equipment ID: (Dwg No., Model No., Part No., etc.)

Manufacturer: (Name and address)

2. The above listed equipment is approved for Grade (Choose: A or B), Class (Choose: I, II, or III), Type (Choose: A, B, or C), (Choose: Deck, Hull, Shell, or Wetted-Surface) Mounted applications (add any applicable limitations, such as "...on CG 47 Class Ships"). Enclosure (1) provides additional information concerning this shock qualification approval.

3. The appropriate shock qualification note, referencing this letter, shall be added to the above drawings in accordance with MIL-S-901. This note shall also state: "Any change to this drawing or lower tier drawing requires review and approval to maintain shock certification."

4. State any contractual implications or provisions which apply to this correspondence, such as: "The requirements of this letter do not authorize any change in the terms, conditions, delivery schedule, or price or amount of the subject contract or any other Government contract. In the event the Contractor considers that these requirements represent a change for which an equitable adjustment is in order, the Contractor is to advise the

22

2885

Contracting Officer of the particular technical or contractual requirements regarded as changed and take no action with regard to such changed requirements until notified, in writing, of the Contracting Officer's response. However, if the contract contains the clause entitled "Notification of Changes," then the Contractor shall comply with the notification provisions therein."

Copy to: (Distribute copies in accordance with MIL-S-901 and in accordance with terms of the contract. Ensure that a copy is furnished to NAVSEA 55X13 and NAVSSES 045B for inclusion in the Navy's shock qualification data base.)

* For first-time shock qualifications, reference the shock test report and any other documentation (e.g. post-test inspection reports) which were submitted to support the request for shock qualification approval. For shock test extension requests, reference the original Government approval letter and any other supporting reports.

ENCLOSURE (1)
SHOCK TEST ACCEPTANCE INFORMATION

1. The item identified below has met the requirements of Military Specification MIL-S-901, based upon:

[ ] Shock testing of the item identified below
[ ] Previous shock testing of an item similar to the item identified below (shock test extension)
[ ] Previous shock testing of an item identical to the item identified below (shock test extension)

2a. Item Nomenclature: _____ b. Description: _____ (Noun, Modifier)

3. Manufacturer: _____

4. Model: _____ 5. Size/Capacity: _____

6. Drawing Number: _____ Revision & Date: _____

7. Military Specification: _____

8. Ship: _____ 9. Service: _____

10. Contract Number: _____

11. Shock Test Facility and Report No.: _____

12. Previous shock test approval reference (shock test extension approval requests only): _____

13. Test Category: [ ] Lightweight [ ] Medium weight [ ] Heavyweight

14. Shock Grade: [ ] A [ ] B

15. Equipment Class: [ ] I [ ] II [ ] III

16. Shock Test Type: [ ] A [ ] B [ ] C

17. Mounting Location: [ ] Deck [ ] Hull [ ] Shell [ ] Wetted-Surface

18. Shipboard mounting plane represented during shock test:

[ ] Base [ ] Front or face [ ] Back
[ ] Top [ ] Combination [ ] Other _____

19. Mounting orientation of item relative to ship's fore-and-aft axis (for medium weight and heavyweight test items only): _____

20. Remarks/Approval Limitations: _____

21. Approved: _____ _____ _____
Authorized Signature Approval Activity Date

2885

24

Enclosure (1)

SHOCK ANALYSIS ACCEPTANCE INFORMATION

1. The item identified below has met the requirements of NAVSEA 0908-LP-000-3010 "Shock Design Criteria for Surface Ships", based upon:

   [ ] Shock analysis of the item identified below
   [ ] Previous shock analysis of an item similar to the item identified below (shock analysis extension)
   [ ] Previous shock analysis of an item identical to the item identified below (shock analysis extension)

2a. Item Nomenclature:_____ b. Description: _____
(Noun, Modifier)

3. Manufacturer:_____

4. Model:_____ 5. Size/Capacity:_____

6. Drawing Number:_____ Revision & Date:_____

7. Military Specification:_____

8. Ship:_____ 9. Service:_____

10. Contract Number:_____

11. Agency/Contractor Completing Mathematical Model: _____

12. Mathematical Model Report No.: _____

13. Mathematical Model Approval Reference: _____

14. Agency/Contractor Completing Dynamic Analysis: _____

15. Dynamic Analysis Report No.:_____

16. Previous shock analysis approval reference (extension approval requests only): _____

17. Shock Grade: [ ] A [ ] B

18. Mounting Location: [ ] Deck [ ] Hull [ ] Shell [ ] Wetted-Surface

19. Shipboard mounting plane represented during shock analysis: _____

20. Mounting orientation of item relative to ship's fore-and-aft axis: _____

21. Remarks/Approval Limitations:_____
_____

22. Approved:_____ _____ _____
Authorized Signature Approval Activity Date